Artificial Intelligence (CPS 270) : Homework 2

Due October 31, 2006

1 Bayes Nets

Consider three binary variables, A, B, and C. Consider two Bayes net structures: (I) A, and B have no parents and have C as a common child. (II) C has no parents, but has A and B as children.

a) Provide CPTs for both Bayes nets so that case I represents a different distribution than case II. Be sure to justify that the distributions are different in a mathematically rigorous way, e.g., by demonstrating that two atomic events have different probabilties.

b) Provide CPTs for both Bayes nets so that case I and case II represent the same distribution. Be sure to justify your claim that the distributions are the same.

2 Bayes Nets II

In the network from Figure 14.2 from the text, compute $P(MaryCalls)$.

3 Bayes Nets III

In the network from Figure 14.2 from the text, compute $P(JohnCalls|MaryCalls = t)$.

4 Bayes Nets IV

What is the complexity of computing the marginal probability of a node in a Bayes net with n binary variables and single cycle? Justify your answer by providing a variable elimination ordering and explaining the replationship between the variable elimination ordering and the total time complexity.

5 HMMs

Do problem 15.2.

6 HMMs II

Do problem 15.4.

7 HMMs III

Do problem 15.12. Note: This problem can be done by hand, but it is a bit tedious. You might prefer to write a small program to do this and then submit your program and its output instead of doing the calculations by hand.